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ABSTRACT

This report summarizes the Engineering Curriculum Transformation Project (ECTP) instituted at the University of Maryland during the 1995-1996 academic year. This initiative focused on facilitating the development of engineering course curricula based on diverse learning styles, more inclusive examples, and the incorporation of diversity and societal issues into the classroom. The report explores the following topics in depth: rationale for curriculum transformation, recruitment of participants, fall semester initiatives, spring semester implementation, program evaluation, preliminary outcomes, and plans for future initiatives in engineering curriculum transformation. Findings of various studies related to curriculum transformation suggested that the most effective structure for implementing the start-up initiative would be the conducting of intensive faculty seminars addressing curriculum change. During the Spring 1995 semester, information on ECTP was disseminated to engineering faculty and six seminars on curriculum transformation were held during the Fall 1995 semester. Two follow-up workshops during Spring 1996 examined what had and had not worked in the participants' revised courses. An evaluation survey revealed that faculty felt the project was a success in providing participants with new knowledge and skills concerning inclusiveness in the classroom and teaching styles. (CK)

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Jennifer L. Vest, Glenna Chang, and William E. Sedlacek

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Summary

During the Fall 1995 semester, the Engineering Curriculum Transformation Project (ECTP) was formally implemented in the A. James Clark School of Engineering at the University of Maryland at College Park. This initiative focused on facilitating the development of engineering course curricula based on diverse learning styles, more inclusive examples, and the incorporation of diversity and societal issues into the classroom. Nine faculty members and ten undergraduate teaching fellows from six engineering courses and representing a variety of engineering disciplines were selected as pilot participants in the project. During Fall 1995, they attended a series of six seminars to prepare them for revising their course curricula for implementation during the Spring 1996 semester. ECTP was led by Deborah Rosenfelt, Director of the Campus Wide Curriculum Transformation Project at UMCP, and was also supported by the Women in Engineering (WIE) Program and the Engineering Coalition of Schools for Excellence in Education and Leadership (ECSEL).

The following report contains a summary of all Engineering Curriculum Transformation Project initiatives during the 1995-1996 academic year. Based on results from formally implemented evaluation measures with faculty participants, undergraduate teaching fellows, and engineering students enrolled in the revised ECTP courses, the following topics will be explored in depth: (1) rationale for curriculum transformation, (2) recruitment of participants, (3) fall semester initiatives, (4) spring semester implementation, (5) program evaluation and preliminary outcomes, and (6) plans for future initiatives in engineering curriculum transformation.

Rationale for Curriculum Transformation

Although each year approximately 25% of all engineering bachelor's degrees are awarded to women and people of color, for the most part engineering schools have been slow to accommodate the needs of their increasingly diverse populations (Anderson, 1995). Thus, attention is increasingly being directed toward the "chilly climate" inherent in many institutions toward women, students from different racial and ethnic backgrounds, and other nontraditional students, particularly in the disciplines of science and engineering. A number of recent studies have also shown that classroom climate issues have a significant impact on students' abilities to learn as well as their likelihood of being retained.

Rosser (1993) proposed a model for curriculum transformation in the sciences that includes the following six phases: (1) absence of women and people of color is not noted; (2) recognition that most scientists are male; (3) examination of the barriers that have prevented large numbers of women from becoming scientists; (4) search for women scientists; (5) focus on work done by women scientists; and (6) development of the "inclusive curriculum." Rosser (1993) concluded that:

> This changed pedagogy attracts more students from more diverse backgrounds to become scientists. This diversity will increase the perspectives of the scientific community and strengthen the rigor of the scientific method. Curricular change combined with transformed pedagogy will result in more scientists from diverse backgrounds to confront the increasingly complex problems of our scientific, technological society. (p. 215)

Similarly, Nair and Majetich (1995) focused their attention on the impact of curriculum content, teaching methods, and teaching style in physics and engineering -- all of which are salient factors that lead large numbers of students, particularly nontraditional students, to leave these fields. They cited earlier introduction of engineering courses, teaching science and

engineering in context (both historically and in terms of practical application in the field), and providing opportunities for students who need help getting up to speed as important interventions toward curriculum transformation (Nair & Majetich, 1995). However, Nair and Majetich (1995) also acknowledged the extreme difficulty inherent in the curriculum transformation process and stated the importance that "colleges and universities provide rewards and opportunities for faculty to engage in innovative teaching techniques and to move toward a student-centered learning environment" (p. 40).

Significant differences by gender in educational persistence among engineering students have been noted by several authors. For example, Astin (1993) of the Higher Education Research Institute conducted a longitudinal study of 25,000 students at 217 institutions and found that only 44% of all students majoring in engineering during their freshman year persisted until their senior year. In addition, women students were found to be more likely to leave engineering than their male peers (Astin, 1993). Thus, college appears to be a time when women may exit the engineering "pipeline" in significant numbers.

Published in 1988, the Greer Report at the University of Maryland at College Park provided an impetus for change toward improving the campus climate for women students at the University. This report proposed:

> . . . a series of workshops, training materials, and resources for faculty in the college to help them understand how difference and diversity affects dynamics in the classroom and how they, as faculty members, can develop effective techniques for encouraging the participation and learning of all students. Training packages will focus on assisting faculty to develop a framework for understanding how age, disability, ethnicity, gender, national origin, race, religion and other types of cultural differences affect learning and teaching styles and interactions between faculty and students, and among students themselves, both inside and outside the classroom.

Based on UMCP's Campus Wide Curriculum Transformation Project in the arts, humanities, and social science disciplines, the Engineering Curriculum Transformation Project (ECTP) was the first initiative at UMCP to focus exclusively on transforming course curricula in the A. James Clark School of Engineering. According to Berman (1994), past endeavors in curriculum transformation at UMCP have demonstrated that intensive faculty development activities are the most effective means by which to achieve curriculum reform. Based on these findings, facilitating six intensive faculty seminars over the course of the semester appeared to be the most effective structure for implementing this start-up initiative.

Recruitment of Participants

During the Spring 1995 semester, ECTP was first introduced to the engineering department chairs by the Dean of the A. James Clark School of Engineering. Information was then disseminated to all engineering faculty. Engineering departments received a total of $5,000 per selected faculty member or team of faculty members to allow for release time from a course, research and travel expenses related to transformation initiatives, and the procurement of course materials. In order to provide faculty the opportunity to more thoroughly involve themselves in the process of curriculum transformation, release time was highly recommended.

In addition, all participating faculty were provided the opportunity to have at least one undergraduate teaching fellow funded through the Women in Engineering Program. Teaching fellows attended ECTP seminars with faculty, assisted them in revising their course curricula, and worked with the actual implementation process in the classroom during the Spring 1996 semester.

A diverse cross section of the A. James Clark School of Engineering was represented in this initiative. All faculty participants and their engineering departments, undergraduate teaching fellows, and revised engineering courses are listed below.

Faculty Participants	Engineering Departments	Undergraduate Teaching Fellows	Engineering Courses
John Anderson	Aerospace Engineering	Kamini Kothari (Fall/ Spring) & Michelle Kurtz (Spring)	ENAE 282: Introduction to Astronautical Systems
David Bigio & Jim Duncan	Mechanical Engineering	Summer Gilbert (Spring) & Jayna Richardson (Fall/ Spring)	ENME 342/343: Introduction to Fluid Mechanics and Fluid Mechanics Lab
Bob Harger	Electrical Engineering	Margaret Peng (Fall)	ENEE 425: Digital Signal Processing
Patricia Mead	Mechanical Engineering	Rhonda Sands (Fall) & Deedee Rosenfeld (Spring)	ENES 100: Introduction to Engineering Design
Mike Ohadi, Reinhard Radermacher, & Jan Sengers	Mechanical & Chemical Engineering	Rita Lin (Fall), Jacinta Kadoma (Fall/Spring), & Ezmeralda Khalil (Spring)	ENCH 468K/ENCH 489K: Environmental Energy Engineering
Norman Wereley	Aerospace Engineering		ENMA 489Y: Smart Materials

Fall Semester Initiatives

Over the course of the Fall 1995 semester, six intensive two-hour curriculum transformation seminars were held for ECTP faculty; teaching fellows; and other UMCP faculty, staff, and students who had an interest in the topics being explored. The ECTP seminars were jointly organized by Julie Goldberg, Assistant Program Coordinator of WIE, and Deborah Rosenfelt, Professor of Women's Studies and Director of UMCP's Campus Wide Curriculum Transformation Project. Each seminar was followed by a period of discussion and reflection

focusing on how the information presented could be used for practical application in transforming participants' course curricula.

Three of the six seminars included outside consultants who were working on curriculum transformation in engineering and the sciences at the national level, including Sue Rosser from the National Science Foundation, Patricia Hynes from the Institute on Women and Technology, and Brian Coppola from the University of Michigan. Through bringing in these outside consultants, ECTP participants were provided the unique opportunity to gain exposure to curriculum transformation initiatives at other institutions; learn about important statistics, trends, and student demographics impacting this area; and seek models on which to base their own course revisions. The three remaining seminars were facilitated by Deborah Rosenfelt and gave participants the opportunity to focus more specifically on their own course curricula.

The chart on the next page contains a complete listing of all ECTP seminar topics, dates, and speakers. A brief description of each of the six seminars follows. Each seminar that featured a guest consultant was videotaped for inclusion in the ECTP resource collection, and these tapes can be borrowed from the WIE Office by anyone who is interested. In addition, one-minute surveys were distributed at the end of each seminar to gain feedback and evaluate their quality and effectiveness. The results from these evaluation measures were compiled in a separate report during the Fall 1995 semester.

Date of Seminar	Topic	Speaker
Wednesday, September 13, 1995	Kick-Off Meeting	Facilitated by Deborah Rosenfelt (UMCP)
Wednesday, September 27, 1995	"Female-Friendly Science and Engineering"	Sue Rosser (Senior Program Officer for Women's Programs, National Science Foundation)
Wednesday, October 11, 1995	"Gender and the Teaching and Learning of Engineering"	H. Patricia Hynes (Director, Institute on Women and Technology)
Wednesday, October 25, 1995	"New Wine in Old Bottles: The Liberal Art of Undergraduate Chemistry Instruction"	Brian Coppola (University of Michigan)
Wednesday, November 15, 1995	"Gender Equity and Teaching"	Facilitated by Deborah Rosenfelt (UMCP)
Wednesday, December 6, 1995	Syllabus Revision Workshop and Faculty Presentations	Facilitated by Deborah Rosenfelt (UMCP)

Seminar One: The first ECTP seminar, designed as a kick-off meeting to begin the semester, was facilitated by Deborah Rosenfelt. The purpose of this meeting was to provide participants with a general introduction to Fall semester initiatives, present current demographic profiles of women and minorities in science and engineering, provide examples of types of syllabi revisions from other courses at UMCP, and to introduce the evaluation component of the project. In addition, faculty and teaching fellows participated in an interactive exercise that explored gender bias in science and engineering.

Seminar Two: The second seminar, "Female-Friendly Science and Engineering," was led by Sue Rosser, Senior Program Officer for Women's Programs at the National Science Foundation (NSF). Based on her research, Rosser presented six phases of curriculum transformation for engineering and the sciences, introduced innovative pedagogical techniques

that can be employed by educators, presented relevant demographics as a rationale for change, and showed specific ways in which science and engineering have been developed from a masculine paradigm.

Seminar Three: The third ECTP seminar, "Gender and the Teaching and Learning of Engineering," featured Patricia Hynes, Director of the Institute on Women and Technology. Based on her research and publications in physics and engineering, Hynes discussed the prevalence of gendered language and gendered concepts in the sciences, as well as the differing socialization processes between men and women. These processes often leave women reluctant to take on leadership roles in the classroom.

Seminar Four: The fourth seminar was led by Brian Coppola, Lecturer of Chemistry and Coordinator of the Undergraduate Organic Chemistry Curriculum at the University of Michigan. His seminar presentation was titled "New Wine in Old Bottles: The Liberal Art of Undergraduate Chemistry Instruction." Coppola discussed the innovative revisions to the chemistry curriculum he introduced and charged that too many disciplines within the academy have become isolated, but can be strengthened through interconnection with other courses and disciplines. Coppola challenged passive learning through engaging students in hands-on and group projects, and also provided a number of concrete suggestions for changing teaching styles and methods in the sciences.

Seminar Five: The fifth seminar, "Gender Equity and Teaching," was facilitated by Deborah Rosenfelt. In this seminar, faculty participants and teaching fellows viewed a video on gender equity and discussed the issue both in the classroom and on campus. Two faculty members, Bob Harger and Pat Mead, presented their revised course curricula for Spring 1996.

Seminar Six: The sixth and final ECTP seminar gave remaining faculty members the opportunity to present their revised syllabi to the group, to provide each other feedback, and to prepare to implement their courses during the Spring 1996 semester.

Spring Semester Implementation

During the Spring 1996 semester, two follow-up workshops were held in February and April to bring participating faculty together once again, to talk about what has and has not worked in their revised courses, to assess how well the ECTP seminars prepared them for their new role, and to discuss the challenges they have encountered in the implementation process. Many faculty also discussed results from evaluation measures they put into place to assess the impact of course revisions on their students. Faculty also completed evaluations about their overall experiences in ECTP and assisted in the development of a student survey (Appendix B) that was administered in a majority of the ECTP-revised courses. In addition, focus groups were held with all ECTP teaching fellows to assess the quality of their experiences and gain their input on improving the program in the future.

Evaluation of ECTP was conducted by Glenna Chang from the ECSEL Program and Jennifer Vest from the WIE Program in consultation with William Sedlacek, Assistant Director of the Counseling Center at UMCP and Professor in the College of Education. In the next section of this report, results from the faculty evaluation component will be discussed in detail.

Program Evaluation and Preliminary Outcomes

In February 1996, the Engineering Curriculum Transformation Survey (Appendix A) was administered to faculty participants. In total, five of nine surveys were returned and provide the

basis for evaluation on the experiences of the faculty project participants.

In response to the question, ***What were your initial expectations for the ECTP seminars?,*** faculty members indicated that they were interested in new attitudes and techniques for inclusion of women and underrepresented minorities in the classroom. The responses were as follows:

- ✓ "Some new insights with regard to gender education."
- ✓ "I was hoping to learn about how to change my course in a way that would make it more interesting to women."
- ✓ "To be alerted of the changing times and the issues we should be aware of with regard to minority and women students. Also revise our course contents to reflect more contemporary needs."
- ✓ "Information on current research. Information on how this issue has played out in other cultures. Brainstorming/discussion on how we may modify our teaching."
- ✓ "The ECTP offered an opportunity to learn about possible gender-dependent differences in learning and, in particular, in learning with technology -- such as computers and computer classrooms -- and how to apply this knowledge in the classroom."

The question, ***Were your expectations fulfilled?*** met with some conflicted responses. While most participants indicated that their expectations were fulfilled, some individuals discussed some areas in which their expectations were not entirely fulfilled. The responses were as follows:

- ✓ "Yes. Mildly disappointed by lack of specific techniques that could be utilized at first. Later, excited about the opportunity to participate in the development of this topic."
- ✓ "Yes. For the most part. In all of the lectures I attended I learned something new and interesting."

✓ "To some extent they were. However, I still don't think we are sure that women will be pleased with the changes we have made."

✓ "Yes."

✓ "Perhaps the expectation was naive. In retrospect, after the formal part of the project and personal supplementary readings, it appears that relatively little is known about precisely how one learns, let along with technology, and whether or not it is gender-related. There is, of course, no lack of theories, papers, anecdotes, and opinions."

The next question was more detailed: ***The goals of ECTP, stated broadly, were to focus on updating course curricula based on diverse learning styles, more inclusive examples, and the incorporation of diversity and societal issues. How well did the seminars meet these goals? Please explain.*** The responses suggest that information in the seminars was processed differently, depending on the professor's understanding of diversity prior to participating in the seminars. The responses were as follows:

✓ "The seminars were good to set general guidance, and provide a frame of mind for thinking."

✓ "Some of the seminars were of great help. Particularly the Prof. from U. Mich. who spoke about their chemistry courses. I learned some interesting ideas for group projects from his seminar."

✓ "Very useful -- revising our course contents and the incorporation of diversity and social issues."

✓ "Good general information given but mostly for sciences such as chem., bio., etc. Engineering examples are not well defined."

✓ "There was some knowledge and some opinions presented about 'diverse learning styles'; it remains unclear to me whether these correlate with gender and/or ethnicity. 'More inclusive examples' were mainly irrelevant to my course but can be accommodated if the occasion arises. 'Incorporation of diversity and societal issues' into other than 'special topic' engineering courses -- e.g., a course on professional aspects -- was never seriously addressed: it is a significant proposition!"

The responses to the question, ***What were the major strengths of ECTP?,*** illustrate the broad needs and interests of the program participants. The most frequently mentioned strength were the guest lecturers and speakers. The responses were as follows:

- ✓ "Interesting lectures, diverse faculty projects."
- ✓ "Good general background."
- ✓ "Interesting speakers."
- ✓ "Open dialogue designed to stimulate ideas. Statistical data/papers and publications and references."
- ✓ "The major impact of ECTP could be on contributing to an increased emphasis on good teaching generally. If there are established gender and ethnicity aspects of learning engineering material these would be logically incorporated. There are possibly significant changes in the profession of engineering education and employment: to some extent ECTP can 'ride the wave.' The experiences of some of the speakers were interesting and a source of ideas."

In response to the question, ***What were its major weaknesses?,*** the participants indicated that they needed more specific help, more time, more follow-up, and more attention to the integration of new material with the established institution of engineering education. One individual was satisfied by the information provided by the project. The responses were as follows:

- ✓ "None, really."
- ✓ "Not much specific help."
- ✓ "Not enough time/resources to follow-up effectively. Continued follow-up should help a lot."
- ✓ "Sometimes not well focused, kind of random. Not enough inclusion of fellows in group discussions."

✓ "There was little or no consideration of the restraints of engineering subject material and its profession may impose on 'curriculum transformation.' The ideology content of much of the material was too high. The intellectual level of much of the material was too low. There was too little -- almost none? -- contribution from engineers."

The responses to the question, ***What was the most useful portion of ECTP for your own work on revising your course(s)?*** showed that the participants found various portions of the project relevant to their particular courses. Several individuals mentioned the benefits of learning from one another, and the benefits of having the support of a teaching fellow. The responses were as follows:

✓ "Examples of how research objectives can be biased, expl: neglecting to study female interactions. Information/papers were given out that I could review for ideas/methodologies."

✓ "Having teaching fellows' assistance. Having an agenda and the presentation we did for the group."

✓ "The U. Mich. seminar."

✓ "Providing me with a teaching fellow, who had some good specific ideas on slightly revising the course."

✓ "The experiences of some of the speakers were interesting, even though rarely directly relevant. Some useful, albeit rather commonly known, teaching techniques emerged. Learning what others in the College are doing in curricula and teaching transformation is useful."

The question, ***What was the least useful portion of ECTP for your own work on revising your course(s)?*** only elicited three responses While the teaching fellows were listed among the most useful portions of ECTP, they were also mentioned in this section On individual indicated that s/he would have preferred more attention given to the status quo of engineering education. The responses were as follows:

✓ "Difficult to identify. ECTP set forth a 'big picture,' which was useful in all its parts."

✓ "At times counted on the teaching fellows too much and that was a lot of frustration. One of the fellows was good, the other unfortunately not so."

✓ "A good share of the distributed material (reprints, etc.) was of marginal worth. The one on '...feminine flows and masculine...' was 'beyond the fringe'! Such material attempts to displace the conventional and accepted technical and abstract view of engineering."

The following question was a Likert Scale item: ***For the most part, the topics were relevant to curriculum transformation in engineering.*** On a scale from one through five, one indicated "strongly agree," while five indicated "strongly disagree," with a continuum between. Four individuals responded to this question, the mean was 4.45 and the standard deviation was 0.5.

The question, ***What made you want to participate in ECTP?*** elicited a variety of responses, including the desire to be a good teacher and a personal investment in gender equality. The responses were as follows:

✓ "Desire to be a good teacher for all students."

✓ "Revising the course content and style of teaching in a course in which a bigger portion of the class participated."

✓ "Female specific examples."

✓ "The course had already been dramatically transformed to use an interactive book in a computer classroom. Methods of learning in this novel learning environment are under continuous study. E.g., I am currently working out more detail in examples and projects, with the active participation of the class. Self-selected groups are allowed and the Final Project will be done in groups of four and presented before the class in the computer classroom using Mathcad (mathematics software). This technology based environment naturally allows increased experimentation, visualization, and motivating examples closer to actual engineering practice."

The question, ***Do you plan any follow-up activities related to ECTP in your department, the university, or a professional association? If yes, please explain.*** was designed to determine whether or not participation in ECTP has long-term effects in engineering education. Several participants mentioned that they intend to continue the efforts established by ECTP. The responses were as follows:

> ✓ "Submitted abstract to WEPAN conference. Proposal of group dynamics activity to ECSEL administrators."
>
> ✓ "I wish you guys will continue what you are doing. No time on our side to initiate such activities. Will not help much if done on individual basis."
>
> ✓ "None at present."
>
> ✓ "The course we are developing will continue to be taught in the new manner."
>
> ✓ "I will be 'transforming' another course next Fall, [name of course], in a similar way. While an interactive book has not been written, the course will be taught in a computer classroom with interactive mathematical software and most of the techniques will carry over. [Name of course] has been a 'problem course,' with too much theory without a 'payoff' and with inappropriate emphasis for the 'digital age.' As this course is a prerequisite to the courses of greatest interest currently, the restraints on content and pace are more severe. The use of symbolic and numerical mathematics and graphical visualization, with interactive participation will offer new and 'diverse learning methods' to the students."

The role of the teaching fellows has been discussed previously in both the 'most valuable' and 'least valuable' questions. The question, ***What role has your teaching fellow played in the curriculum transformation process?,*** addresses this issue directly. Overall, it appears that the teaching fellows were helpful in providing support and insightful perspectives on the course content and revised syllabus. The responses were as follows:

> ✓ "Their most important role is feedback on what we are doing and ideas from a student perspective."

✓ "This has already been discussed above: My teaching fellow is giving several presentations to the class, following her own suggestions and ideas, about the nature of specific space vehicles and programs, hence enhancing the value of the class especially to women."

✓ "Assisted in collecting the information and also at times I consulted with her on how we should conduct the class/lecture."

✓ "General goals and directions/objectives. Oversee evaluation component."

✓ "The Fellow generally did not participate, apparently due to difficulties in her courses-probability. She did give a helpful reading of the revised syllabus. Her participation was made difficult because of the course level, though an appropriate activity was planned: giving a short lecture on electronic file transfer and the 'intranet.'"

The question, ***What changes should be made if ECTP were to be offered again?,*** elicited a number of excellent suggestions. Many of these topics have been discussed earlier in this report, and illustrate specific themes in the professors' experiences. The responses were as follows:

✓ "Inclusion of undergrads in group discussions. More time spent on planning specific content changes actual courses."

✓ "I was happy with the current approach."

✓ "The ECTP process that I went through was good. If anything, more speakers, both from inside and outside the university, would be even better."

✓ "Try to give professors more specific suggestions on what would be good modifications."

✓ "Women who have engineering experience should be brought in as many ways as possible: principal, speakers, resources, etc. Use them to introduce relevant material and experiences."

Given that one of the goals of ECTP is wide-scale reevaluation of engineering education with an emphasis on inclusiveness, it is essential that a great many instructors become involved with the process. The question, ***What would encourage other engineering faculty to participate***

in ECTP? is aimed at finding the most effective manner to reach faculty members. The responses were as follows:

> ✓ "I think many are interested but know that there is a negative reward because of the impact of course development on research."
>
> ✓ "I don't honestly know. It is such a personal thing -- depending on one's interest in these matters."
>
> ✓ "The need to revise the course contents, the awareness of the new more diverse student population."
>
> ✓ "Fellows, relaxed teaching requirements during the semester in which ECTP is implemented."
>
> ✓ "It is difficult to involve the majority of the faculty. For several decades, research universities and, in particular, this Engineering College allow essentially one way to earn promotion and remuneration: research.

The question, ***Suggestions for future ECTP seminar topics,*** solicited ideas for upcoming years in ECTP. ECTP is an evolving program with an investment in the most current pedagogical methods and research. Therefore, suggestions for the future would serve to broaden the scope of the project. The responses were as follows:

> ✓ "Diversity training workshops."
>
> ✓ "Creative instructional practices. Successful experiences gained in dealing with diverse student groups and various institutions."
>
> ✓ "Maybe more case histories to help illustrate the problems and solutions."
>
> ✓ "Involve women who are, or have had experience as, engineers in ECTP in various capacities and levels as principal, speakers, advisors or relevant topics, ... How about the ECTP arranging a 'mini-symposium' on 'innovative teaching methods for diverse learning styles'; the participants in this year's ECTP could be 'leaders'... The project lists 'accommodation of diverse learning styles' as a major aim. The project didn't clarify this. I would like to learn about it for my own immediate purposes. The ECTP could invite a disinterested expert to present a summary of the knowledge about this. (No small topic! But there is serious work

available -- Gardner, Armstrong, ...)

Conclusions and Plans for Future Curriculum Transformation Initiatives

Overall, this first year of the Engineering Curriculum Transformation Project appears to have been a successful endeavor. All participants indicated that they gained some knowledge and skills concerning inclusiveness in the classroom and teaching styles. Faculty participants appreciated the opportunity to work closely with teaching fellows, and enjoyed the workshop presentations. Most faculty members indicated that they were pleased with the program as a whole.

There were, however, some suggestions concerning the structure and content of the project. Generally, the participants enjoyed the speakers at the seminars, although some individuals indicated that more emphasis on issues specific to engineering would have been beneficial. In addition, participants would have preferred if the teaching fellows had been more active in the discussions at the conclusion of the seminars. Also, participants would have appreciated more specific suggestions for course restructuring, which would eliminate the ambiguity of the project. One participant was particularly concerned about the integration of the transformation information with the established status quo of engineering education. Finally, several suggestions concerned the inclusion of women in engineering students, educators, and professionals as speakers or consultants.

Although not all faculty in the A. James Clark School of Engineering will have the opportunity to become involved in ECTP, faculty who participate in the project each year will receive support to disseminate their knowledge and ideas to others in their department and discipline through publications and presentations. For the Fall 1996 semester, a graduate

assistant has been hired through WIE and ECSEL to focus exclusively on curriculum transformation initiatives in the School of Engineering. In addition, two faculty members who participated in ECTP recently submitted a grant proposal to seek additional funding for the project.

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Appendix A

Engineering Curriculum Transformation Project Survey
A. James Clark School of Engineering
University of Maryland at College Park
1995-1996

What were your initial expectations for the ECTP seminars?

Were your expectations fulfilled? yes no

The goals of ECTP, stated broadly, were to focus on updating course curricula based on diverse learning styles, more inclusive examples, and the incorporation of diversity and societal issues. How well did the seminars meet these goals? Please explain.

What were the major strengths of ECTP?

What were its major weaknesses?

What was the most useful portion of ECTP for your own work on revising your course(s)?

What was the least useful portion of ECTP for your own work on revising your course(s)?

For the most part, the topics covered in the seminars were relevant to curriculum transformation in engineering.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

What made you want to participate in ECTP?

What major impact did ECTP have on you?

My perspectives, assumptions, and approaches to my engineering discipline changed as a result of the ECTP experience.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Based on the question above, provide specific examples:

- What changes are you implementing in your revised course(s) this semester?

    a. Course Content:

    b. Pedagogy/Methods of Instruction:

Do you plán any follow-up activities related to ECTP in your department, the university, or a professional association? If yes, please explain.

What role has your teaching fellow played in the curriculum transformation process?

- What changes should be made if ECTP were to be offered again?

What would encourage other engineering faculty to participate in ECTP?

Suggestions for future ECTP seminar topics:

Appendix B

Student Survey
Spring 1996 Semester
A. James Clark School of Engineering

The A. James Clark School of Engineering is concerned with providing a comfortable and supportive learning environment to all students. Based on your experiences in this class, please complete this anonymous survey. This survey will address your perceptions and experiences surrounding gender, race/ethnicity, and learning styles. Your response to this survey will in no way impact your grade in this class. The results of this survey will be used to enhance the learning experiences of students at the University of Maryland at College Park.

Please check the appropriate response.

GENDER:

_____ Male
_____ Female

CLASS STATUS:

_____ First Year
_____ Sophomore
_____ Junior
_____ Senior
_____ Other _____ (please specify)

ETHNIC IDENTITY:

_____ African-American/Black
_____ Asian-American
_____ Native American
_____ White/Caucasian of European descent
_____ White/Caucasian of Middle Eastern descent
_____ Hispanic/Latino/Latina
_____ Biracial/Multiracial: _____ (please specify)
_____ Citizen of another country: _____ (please specify)
_____ Other: _____ (please specify)

Questions 1 through 14 pertain to your experiences in this class . . .

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Please circle one:

1 2 3 4 5 1) The instructor provides a comfortable learning environment for all students regardless of their gender.

1 2 3 4 5 2) The instructor provides a comfortable learning environment for all students regardless of their race/ethnicity.

1 2 3 4 5 3) My classmates provide a comfortable learning environment for all students regardless of their gender.

1 2 3 4 5 4) My classmates provide a comfortable learning environment for all students regardless of their race/ethnicity.

1 2 3 4 5 5) The manner in which the course material is presented has increased my interest in this subject.

1 2 3 4 5 6) The manner in which the course material is presented has encouraged my participation in class discussions.

1 2 3 4 5 7) The manner in which the course material is presented has increased my interest in further pursuing this field of study.

1 2 3 4 5 8) The manner in which the course material is presented has facilitated my understanding of the course material.

1 2 3 4 5 9) The instructor uses examples that are inclusive of different groups of people in terms of race/ethnicity and gender in class lectures and discussions.

1 2 3 4 5 10) The instructor uses examples that are inclusive of different groups of people in terms of race/ethnicity and gender in written exams.

1 2 3 4 5 11) The instructor uses examples that are inclusive of different groups of people in terms of race/ethnicity and gender in homework assignments.

1 2 3 4 5 12) It is important that instructors use examples that are inclusive of different groups of people in terms of race/ethnicity and gender.

1 2 3 4 5 13) I consider the course instructor to be an individual skilled in supporting and encouraging all students.

1 2 3 4 5 14) As a result of taking this class, I have greater confidence in my ability to become an engineer.

15) What suggestions (if any) do you have for creating a more comfortable and supportive learning environment in this class?

For questions 16 through 24, please indicate the extent to which you agree or disagree with the following statements . . .

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Please circle one:

1 2 3 4 5 16) Gender biases occur within the field of engineering.

1 2 3 4 5 17) Racial/ethnic biases occur within the field of engineering.

1 2 3 4 5 18) Gender biases occur in this class.

1 2 3 4 5 19) Racial/ethnic biases occur in this class.

1 2 3 4 5 20) Lack of gender diversity is a major problem within the field of engineering.

1 2 3 4 5 21) Lack of racial/ethnic diversity is a major problem within the field of engineering.

1 2 3 4 5 22) Lack of gender diversity is a major problem in this class.

1 2 3 4 5 23) Lack of racial/ethnic diversity is a major problem in this class.

1 2 3 4 5 24) Initiatives should be taken by the A. James Clark School of Engineering to create a comfortable and supportive learning environment for all students.